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(58) Field of search
G2J

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(54) Connectors for optical fibres

(57) In a connector an optical fibre cable is passed through a crimp body 6 and collet 5. Then a threaded shell 4 and ferrule 3 is screwed onto collet 5 so that its tines 20 are compressed in the ferrule onto the buffer coating of the cable at a location behind an end portion from which the buffer coating has been removed. Thus, the optical fibre passes through a precision hole 19 for its projecting end to be removed by a cleaving blade passed down a slot 22. Two connectors may be fixed to opposite ends of a ridged coupler by coupling nuts 1 to bring opposed fibres into register.

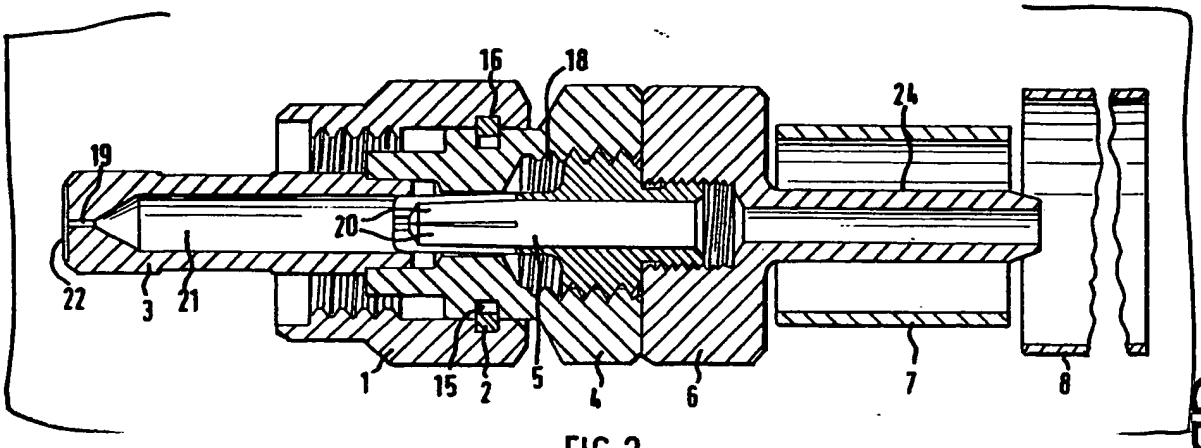

FIG.2

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The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.

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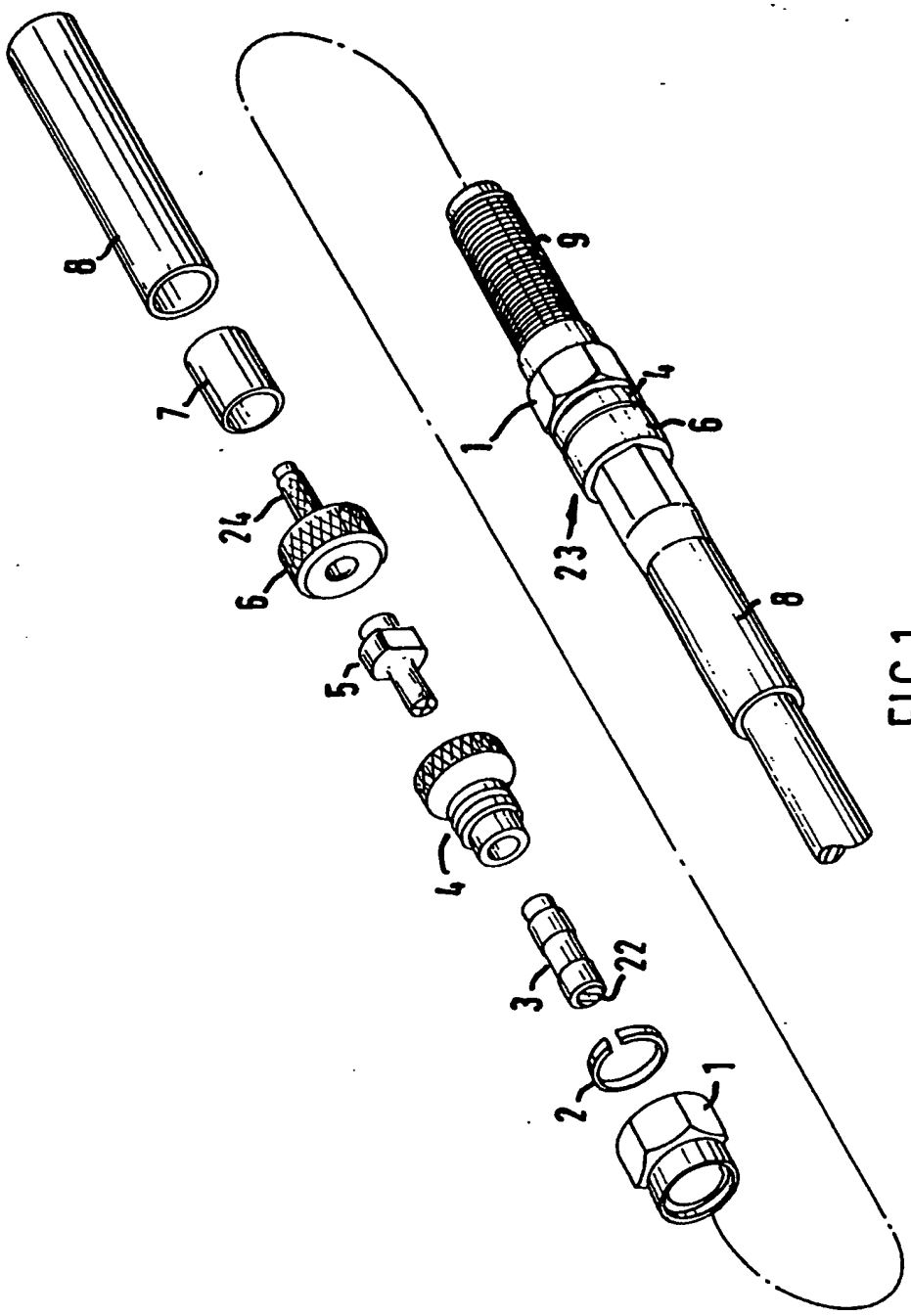


FIG.1

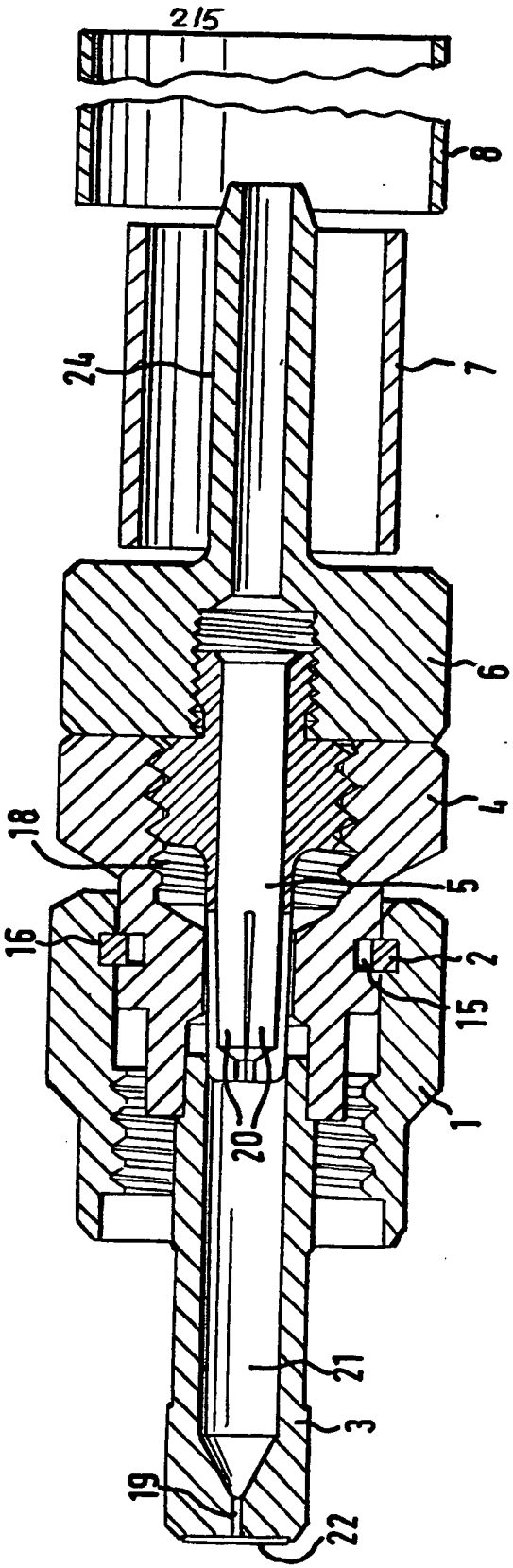


FIG.2

FIG.3

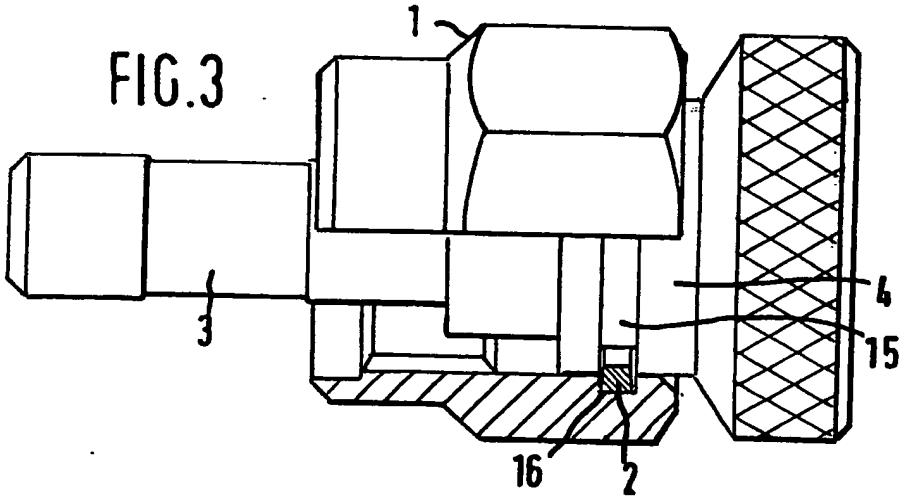


FIG.4

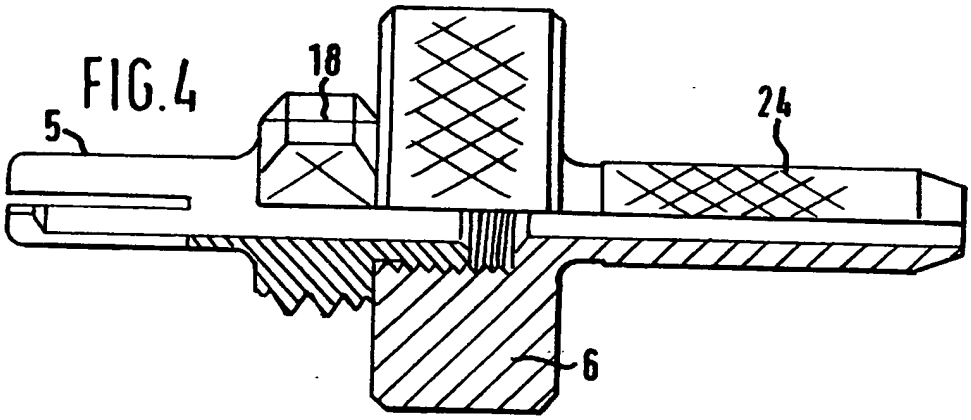


FIG.6

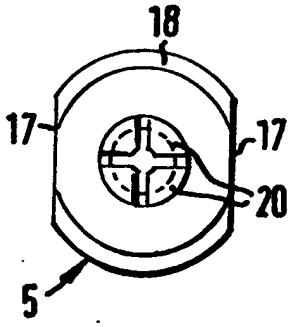
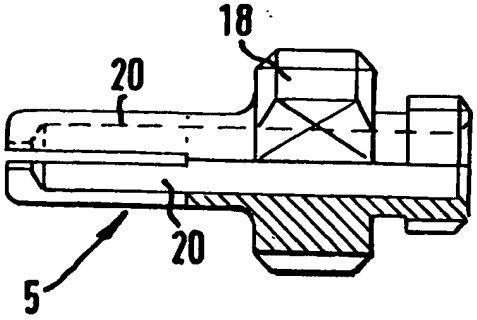


FIG.5



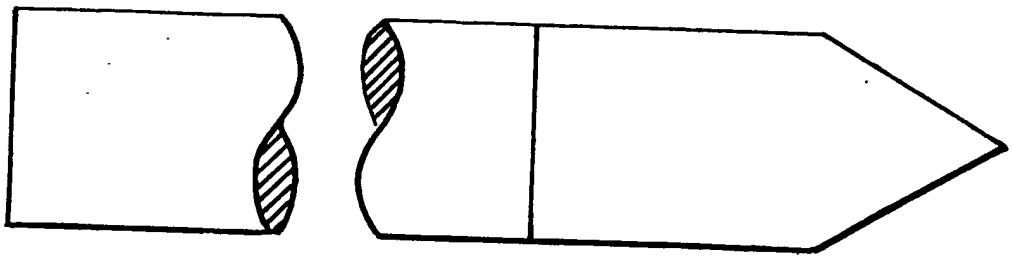


FIG. 7

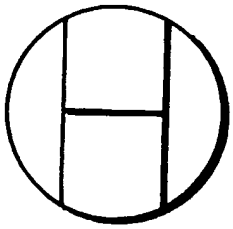


FIG. 8

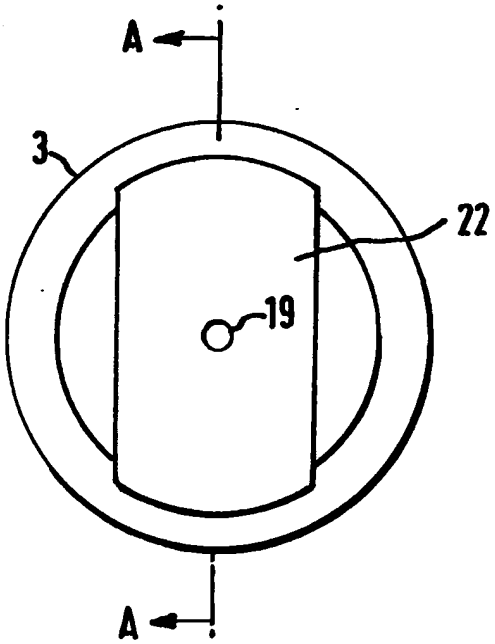


FIG.9

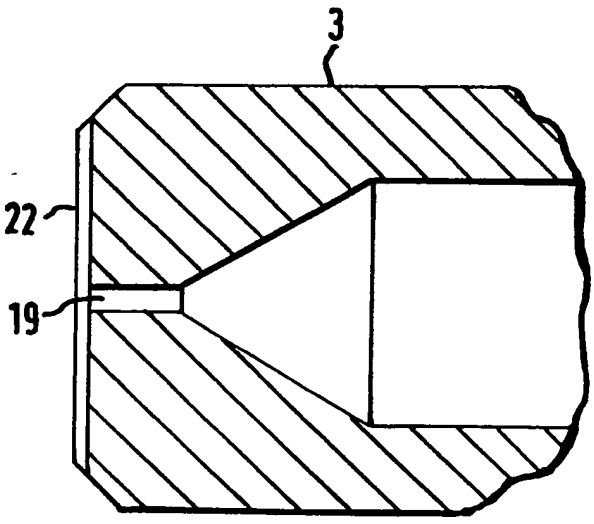


FIG.10

SPECIFICATION

Improvements for connectors for optical fibres

This invention relates to connectors for joining optical fibres coaxially.

The invention is primarily concerned with the connection of multimode fibres. The fibres with which the invention is very usefully employed have a core diameter of from 50 μ to 200 μ. These values, when the cladding is taken into account are 125 μ and 400 μ. The optical fibres taking the outer protection into account have a diameter up to 1 mm.

A primary object of the invention is to provide an effective protector in which no adhesive is used and at the same time to ensure the maintenance of accurate positioning of the fibre within the connector and to provide adequate fibre retention strength.

According to the invention a connector for use in connecting two optical fibres end to end comprises a collet for gripping the buffer coating of an optical fibre cable and a ferrule for receiving the cable from the collet and leading the end of the optical fibre, or optical fibre with cladding thereon, from which the buffer coating has been removed, through a precision hole in axial alignment with the collet so as to be used to present a termination of the fibre for register with the termination of a similar fibre. Very conveniently the exposed end of the ferrule is formed with a diametral slot extending over the precision hole, along which slot a sharp cleaving blade can be passed to nick the optical fibre or cladding to enable a clean division to be made in the fibre leaving an exposed cross-section of the fibre at the front of the precision hole.

Preferably the ferrule forms part of a first subassembly and the collet forms part of a second subassembly, the sub-assemblies being screwed together thereby forcing tines of the collet into the ferrule and closing them onto the buffer coating of the cable.

Two such connectors may be fixed to opposite ends of a rigid coupler by coupling nuts to bring opposed optical fibres into register.

In order that the invention may be clearly understood and readily carried into effect a connector for connecting optical fibres coaxially will now be described by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an exploded view of a connector;

Figure 2 is a sectional elevation of an assembly in the connector of Figure 1;

Figure 3 is an elevation, partly in section, of a first sub-assembly in the assembly of Figure 2;

Figure 4 is an elevation, partly in section of a second sub-assembly in the assembly of Figure 3;

Figure 5 is an elevation, partly in section, of a collet body;

Figure 6 is an end elevation of the collet body of Figure 5.

Figures 7 and 8 are respectively side and end elevations of a tool

Figure 9 is an end view of a ferrule; and

Figure 10 is a section on line A-A in Figure 9.

To form the first sub-assembly, Figure 3, a ferrule 3 is press fitted into a threaded shell 4. A C clip 2 is then pressed into a groove 15 in the threaded shell 4 and is held in the groove until a coupling nut 1 is brought over the ferrule 3 and threaded shell 4. The C clip is thereupon released until it is located both in the groove 15 and a groove 16 in the coupling nut 1.

To form the second sub-assembly, Figure 4, a collet body 5, Figures 5, 6, is first selected to suit the diameter of the fibre buffer coating of the cable. The collet body 5 is then screwed into a crimp body 6 by means of a small spanner which engages opposed flat faces 17, Figure 6, on a larger screw threaded part 18 of the collet body 5.

The complete assembly is then begun by passing the cable through a heat ring tube 8 and crimp ring 7 and by stripping the buffer coating from a forward part of the cable until the cladding of the optical fibre is exposed. The stripped cable is inserted through the second subassembly, Figure 4, until the buffer coating of the cable protrudes through the front face of the collet body 5 by a length of approximately 5 mm. The length of the optical fibre that is stripped to the cladding surface is threaded through the first sub-assembly, Figure 3, until it protrudes through a precision hole 19 in the ferrule 3.

Using finger pressure only, the first sub-assembly is mated with the second sub-assembly by screwing the threaded shell 4 in a clockwise direction on the larger screw threaded part 18 of the collet body 5 until the back face of the threaded shell 4 butts against the front face of the crimp body 6. By this action the four tines of the collet body 5 are forced into the internal passage 21 of the ferrule 3 which passage is of such a diameter as to close the four tines 20 down onto the buffer coating of the fibre. This results in the optical fibre being fixed in position in relation to the connector.

The exposed cladding protruding through the precision hole 19 in the ferrule 3 is now cleaved by means of a sharp cleaving blade, Figures 7, 8, made of tungsten carbide. The cleavage is effected by running the blade along a slot 22, Figures 1, 9, 10 in the end of the ferrule 3 so that a nick is made in the cladding of the optical fibre. The cleaving blade is then removed from the slot and the exposed optical fibre is given a sharp flick from the direction in which the nick was

made. A clean division of the fibre is therefore made leaving an exposed cross-section of the fibre at the front of the precision hole 19.

That part of the cable which passes through a tubular part 24 of the crimp body 6 has a PVC sheath with Kevlar fibres stripped from the cable to pass over the part 24 and butt against the crimp body 6. The crimp ring 7 is now closed down onto the stripped part of the cable by compressing a hexagonal die-tool BS 5310-28-VQ onto the crimp ring 7. The heat shrink tube 8 is then brought towards the connector and shrunk into place over the crimp ring 7 and the cable by means of a heat gun. This terminates the formation of the optical connector.

To form a junction with another optical fibre, the ferrule 3 is fed through one end of a rigid tubular coupler 9 until the internal thread of the coupling nut 1 engages an external thread on the coupler 9. The engagement is completed by rotating the coupling nut 1 in a clockwise direction. This action is completed when the front face of the threaded shell 4 butts against an internal shoulder of the rigid coupler 9. The junction between the optical fibres is complete when another connector 23 of the same construction is fixed to the rigid coupler 9 from the opposite direction.

The drawings are obviously on an enlarged scale. In practice, one example of the connection is approximately 30 mm long.

CLAIMS

1. A connector for use in connecting two optical fibres end to end, the onnector comprising a collet for gripping the buffer coating of an optical fibre cable and a ferrule for receiving the cable from the collet and leading the end of the optical fibre, or optical fibre with cladding thereon, from which the buffer coating has been removed, through a precision hole in axial alignment with the collet so as to be used to present a termination of the fibre for register with the termination of a similar fibre.

2. A connector according to Claim 1, in which the exposed end of the ferrule is formed with a diametral slot extending over the precision hole, along which slot a sharp cleaving blade can be passed to nick the optical fibre or cladding to enable a clean division to be made in the fibre leaving an exposed cross-section of the fibre at the front of the precision hole.

3. A connector according to Claim 1 or Claim 2, in which the ferrule forms part of a first sub-assembly and the collet forms part of a second sub-assembly, the subassemblies being screwed together thereby forcing tines of the collet into the ferrule and closing them onto the buffer coating of the cable.

4. A connector according to any one of the preceding claims, comprising a coupling nut rotatably mounted on a shell carrying the ferrule and screwed onto the collet, the coupling nut being formed to screw onto one end of a rigid coupler to bring the termination of the fibre into register with the termination of a second fibre in a similar connector screwed onto the other end of the coupler.

5. A connector according to any one of the preceding claims, in combination with a cable wherein the cable passes through a crimp body carrying the collet and having a tubular part over which a layer stripped from the cable passes inside a crimp ring.

6. The combination of two connectors each according to any one of the preceding claims and each provided with coupling nuts, the coupling nuts respectively being screwed onto opposite ends of a rigid coupler with registration of the terminations of the fibres respectively in the connectors.

7. A connector substantially as hereinbefore described with reference to the accompanying drawings.

CLAIMS

Amendments to the claims have been filed, and have the following effect:

New or textually amended claims have been filed as follows:

8. A plug connector for providing a connection to an optical fibre at an end portion thereof from which a buffer coating has been removed to expose the fibre, comprising a proximal portion into which the buffer coated fibre passes and a distal portion including a ferrule formed with a front face defining an abutment plane for the ferrule and having an aperture through which the exposed fibre passes, wherein relative rotation of the proximal and distal portions of the connector engages resiliently flexible clamping means with the buffer coating to locate the fibre axially with respect to the connector and portions of the front face of the ferrule extending over the aperture are relieved to permit the fibre to be severed without its cut end protruding beyond the abutment plane.

9. A connector according to Claim 8, wherein the proximal and distal portions are connected by interengaging threads and enclose a resiliently compressible member arranged to close onto the buffer coating as said portions are screwed together.

10. A connector according to Claim 9, wherein the proximal member carries a collet, the tines of which are forced into a bore in the ferrule as said portions are screwed together and close onto the buffer coating.

11. A connector according to any of Claims 8 to 10, wherein the front face of the ferrule is formed with a diametral slot extending over the aperture to accept a clearing blade movable across the slot to score cladding of the fibre and enable a clean division to be made.

12. A connector according to any of Claims

8 to 11, wherein the distal portion comprises a coupling nut rotatably located on a shell carrying the ferrule.

13. A connector according to any of Claims 8 to 12, wherein portions of the proximal portion define a rearwardly facing crimp body for fitting a sleeve of heat shrinkable material.

14. A connector according to Claim 13, further comprising a crimp ring that fits onto the crimp body under the sleeve.

15. A pair of optical fibres spliced by means of a pair of connectors as claimed in any of Claims 8 to 14 fastened by their coupling nuts to opposite faces of a rigid coupler into which the ferrules fit in abutment with their respective optical fibres in registration.

16. A method of providing a connection to an optical fibre which comprises removing buffer coating from an end region of an optical fibre, passing the fibre into a plug connector having relatively rotatable proximal and distal portions so that the buffer coating enters the connector and the exposed fibre protrudes through an aperture in a front face defining an abutment plane of a ferrule, said aperture being centered on the axis of the ferrule, relatively rotating the proximal and distal portions to engage clamping means of said connector with the buffer coating and locate the fibre axially with respect to the connector, introducing a scribing tool into a region of said ferrule extending over the aperture and relieved behind the abutment plane, passing said scribing tool across the fibre to scribe it at an axial position behind the abutment plane and severing the fibre by pulling or bending its exposed portion to give an immediately usable cleaved optical face.

17. A method according to Claim 16, wherein the scribing tool is passed into a diametral slot formed across the front face of the ferrule and relieved by a distance of 15 to 25 microns from remaining portions of said front face defining an abutment surface, the cleaved face protruding about 5 to 10 microns beyond the slot.

18. A method according to Claim 16 or 17, wherein relative rotation of the proximal and distal portions serves to force tines of a collet carried by the proximal portion into a bore in the distal portion so that said tines are collapsed onto the fibre.

19. A method according to Claim 16, 17 or 18, further comprising the step of introducing the ferrule of the plug connector into one face of a rigid coupler, introducing the ferrule of a second plug connector into the other face of the rigid coupler and fastening the first and second plug connectors to the coupler by means of clamping nuts, the ferrules abutting with their optical fibres aligned but not in contact.

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